

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A multistage catalytic partial oxidation process for recovering elemental sulfur from a H₂S-containing gas stream, the process comprising:

contacting said H₂S-containing gas stream with a catalyst that is active for catalyzing the partial oxidation of H₂S in the presence of oxygen to form S⁰ and H₂O, said catalyst comprising multiple catalytic regions;

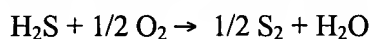
providing the total stoichiometric amount of oxygen required for the catalytic partial oxidation of the H₂S in said H₂S-containing gas stream to S⁰ and H₂O in at least two increments, respectively, to at least two of said catalyst regions, such that a product gas mixture is formed comprising S⁰ and H₂O; and

condensing elemental sulfur from said product gas mixture.

2. (Original) The process of claim 1 comprising maintaining the temperature of each said catalyst portion above 300°C.

3. (Currently amended) The process of claim 1 comprising:

a first stage comprising contacting a first feed gas stream comprising a mixture of H₂S and an initial incremental amount of an O₂-containing gas with a first catalyst portion, said catalyst comprising multiple portions and having activity for catalyzing the partial oxidation of H₂S to elemental sulfur and water, whereby a first stage product gas mixture is formed, said initial incremental amount of O₂-containing gas containing less than the stoichiometric amount of O₂ in the reaction



needed to convert all of the H₂S in said first feed gas stream, whereby a first stage product gas stream comprising elemental sulfur, steam and unreacted hydrogen sulfide is obtained;

a second stage comprising contacting said first stage product gas stream with a second catalyst portion following said first catalyst portion;

combining a second incremental amount of O₂-containing gas with said first stage product gas stream, said second incremental amount of O₂-containing gas containing less than the stoichiometric amount of O₂ in said reaction needed to convert all of the unreacted H₂S in said first stage product gas stream to S⁰ and H₂O, whereby a second stage product gas stream comprising S⁰, H₂O and unreacted H₂S is obtained; and

optionally, a third stage comprising combining a third incremental amount of O₂-containing gas with said second stage product gas stream, said third incremental amount of O₂-containing gas containing less than the stoichiometric amount of O₂ in said reaction needed to convert all of the unreacted H₂S in said second stage product gas stream to S⁰ and H₂O, whereby a third stage product gas stream comprising S⁰, H₂O and unreacted H₂S is obtained.

4. (Currently amended) The process of claim 3 comprising regulating the concentration of O₂ in said ~~initial~~ first feed gas ~~mixture~~ stream and the amount of O₂ provided in said second incremental amount of O₂-containing gas such that at least 85% of the H₂S component of the initial feed gas mixture is converted to S⁰ and H₂O by said first and second stages together.

5. (Currently amended) The process of claim 3 including said third stage and comprising:
regulating the concentration of O₂ in said ~~initial~~ first feed gas ~~mixture~~ stream,
regulating the amount of O₂ provided in said second incremental amount of O₂-containing gas,
and
regulating the amount of O₂ provided in said third incremental amount of O₂-containing gas,
such that at least 90% of the H₂S component of the ~~initial~~ first feed gas ~~mixture~~ stream is converted to S⁰ and H₂O by said first, second and third stages together.

6. (Currently amended) The process of claim 3 comprising maintaining a O₂:H₂S molar ratio of less than 0.5 in said ~~initial~~ first feed gas stream when contacting said ~~initial~~ first catalyst portion.

7. (Original) The process of claim 6 comprising establishing a O₂:H₂S molar ratio in the range of 0.30 to 0.43 at the beginning of each of said first, second and third stages.

8. (Original) The process of claim 3 comprising:

passing said second or third stage product gas mixture into a cooling zone and cooling said gas mixture sufficiently to form liquid sulfur and a desulfurized effluent gas stream.

9. (Original) The process of claim 8 wherein said cooling comprises:

cooling said gas mixture to a temperature above the dewpoint of sulfur, to provide a partially cooled product stream;

passing said partially cooled product stream into a sulfur condenser and further cooling said partially cooled product stream to the dewpoint temperature of gaseous elemental sulfur, or lower, but above the melting point of solid sulfur, such that the liquid phase of said sulfur product is favored; and withdrawing liquid sulfur from said sulfur condenser.

10. (Original) The process of claim 1 comprising maintaining the temperature of said catalyst in the range of 700-1,500°C.

11. (Original) The process of claim 10 comprising maintaining the temperature of said catalyst between about 850°C - 1,300°C.

12. (Original) The process of claim 1 comprising preheating said H₂S-containing gas stream to about 200°C before contacting said first catalyst portion.

13. (Original) The process of claim 1 comprising maintaining a catalyst contact time of no more than about 200 milliseconds.

14. (Original) The process of claim 1 comprising operating said process at a space velocity of at least about 20,000 h⁻¹.

15. (Original) The process of claim 1 comprising operating said reactor at superatmospheric pressure.

16. (Original) The process of claim 1 wherein said catalyst comprises a refractory support chosen from the group consisting of one or more oxides of Al, Zr, Mg, Ce, Si, La, Sm and Yb.

17. (Original) The process of claim 1 wherein said catalyst comprises at least one metal chosen from the group consisting of Pt, Rh, Ru, Ir, Ni, Pd, Fe, Cr, Co, Re, Rb, V, Bi, Sn and Sb.
18. (Original) The process of claim 17 wherein said catalyst comprises Pt, Rh or a mixture thereof.
19. (Original) The process of claim 17 wherein said catalyst comprises V, Bi, Sn or Sb.
20. (Original) The process of claim 17 wherein said catalyst further comprises at least one lanthanide element chosen from the group consisting of La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
21. (Original) The process of claim 17 wherein said catalyst further comprises at least one alkaline element chosen from the group consisting of Mg, Ca and Ba.
22. (Currently amended) The process of claim ~~21~~ 20 wherein at least one said lanthanide element is Sm, Yb or Pr.
23. (Currently amended) The process of claim ~~21~~ 20 wherein said catalyst comprises platinum and samarium oxide.
24. (Original) The process of claim 21 wherein said catalyst comprises platinum and magnesium oxide.
25. (Currently amended) The process of claim ~~21~~ 20 wherein said catalyst comprises rhodium and samarium oxide.
26. (Original) The process of claim 21 wherein said catalyst comprises rhodium and magnesium oxide.
27. (Currently Amended) The process of claim 20 wherein said catalyst comprises a platinum-rhodium alloy on a lanthanide oxide coated refractory support.

28. (Original) The process of claim 27 wherein said catalyst comprises a samarium oxide coated refractory support.

29. (Original) The process of claim 21 wherein said catalyst comprises a platinum-rhodium alloy on a alkaline oxide coated refractory support.

30. (Original) The process of claim 29 wherein said catalyst comprises a magnesium oxide coated refractory support.

31. (Original) The process of claim 17 wherein said catalyst comprises at least one carbided metal.

32. (Original) The process of claim 31 wherein said carbided metal comprises platinum and rhodium.

33. (Original) The process of claim 1 wherein said catalyst comprises at least one structure chosen from the group consisting of gauzes, monoliths and a plurality of divided units.

34. (Currently amended) The process of claim ~~33~~ 33 wherein said divided units comprise particles, granules, beads, pills, pellets, cylinders, trilobes, extrudates or spheres.

35. (Original) The method of claim 34 wherein each said divided unit is less than 25 millimeters in its longest dimension.

36. (Original) The method of claim 35 wherein each said divided unit is less than 10 millimeters in its longest dimension.

37–44. (Canceled)